19 000 atm., which we write as 17 500±1 500 atm. We believe the results may fairly be stated as follows :

At 1 atm., the value of T_c determined by us agrees with the normal value (3·73°K), within experimental error.

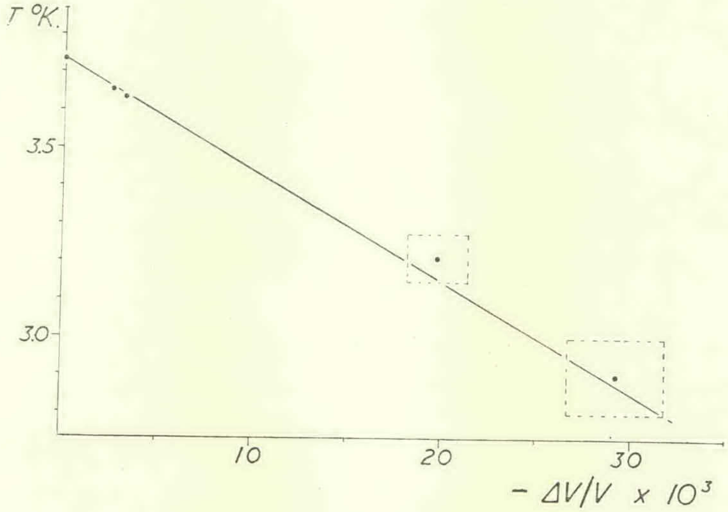
At 11 500±1000 atm., $T_c=3\cdot21\pm0\cdot07$°K.

At 17 500±1500 atm., $T_c=2\cdot9\pm0\cdot1$°K.

It is important to emphasize that the curves represent reversible behaviour and the effects shown are therefore not due to work-hardening (or ' cold-working '). After relaxing the pressure the curve obtained with a given specimen is indistinguishable from that obtained before the application of pressure.

Combining these with the results of Kan, Sudovstov and Lazarew (1948), and making use of Bridgman's values (Bridgman 1949) for the compressibility of tin, it is possible to plot T_c against $\Delta V/V$, where ΔV is the change in volume due to the increase in pressure. This is done in fig. 3, where it may be seen that the variation is linear, within experimental error, and that the earlier and the present results lie on the same line.

Fig. 3



Relation between transition temperature and change in volume for tin under pressure. The areas enclosed by the dotted lines indicate the estimated experimental uncertainty in the present work.

The relation derived from the graph is

$$T_c\,(^\circ\mathrm{K})=3\cdot73+29\,(\Delta V/V)$$

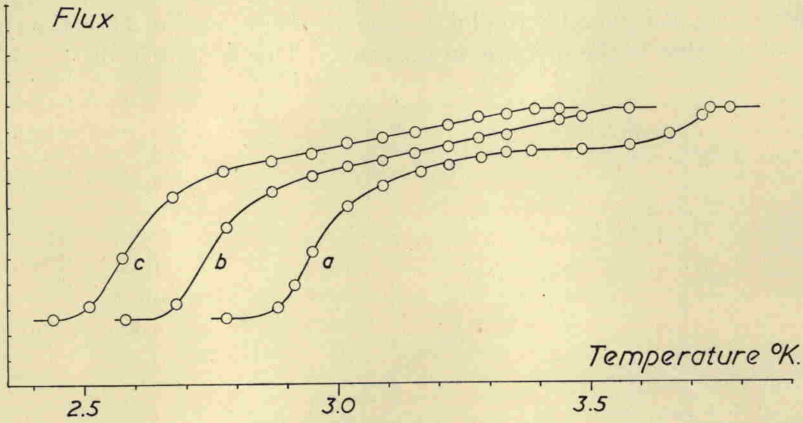
where the coefficient of $\Delta V/V$ may be in error by ±10% at the lower pressures and by ±20% at the higher pressures.

We have also observed transitions under the highest of these pressures for a number of differing values of magnetic field (in the plane of the disc).

The curves obtained are shown in fig. 4. A field of 50 gauss depresses the foot of the curve by about 0·37°. The corresponding depression at 1 atm. (see for instance Shoenberg 1952) would be 0·35°. Thus the quantity dH_c/dT at the temperature T_c remains substantially constant under pressure. At a given temperature H_c is of course lowered by pressure.

The magnitude of the quantity H_0, equal to $(H_c)_{T=0}$, is of theoretical significance since it is related to the difference in energy between the normal and superconducting states at absolute zero. Our experiments have not yet been carried to a sufficiently low temperature to determine the form of the curve of H_c against T, but we may point out that if it has the approximately parabolic form characteristic of tin at 1 atm., then the present results imply that H_0—and therefore the energy difference between the normal and superconducting states—is lowered by compression.

Fig. 4



Transitions of tin under 16 000 atm. mean pressure in differing magnetic fields : (*a*) zero field, (*b*) 23·6 gauss, (*c*) 47·2 gauss. Flux in arbitrary units.

Lead

We have confirmed that T_c for lead is lowered by compression, but have not yet obtained detailed results on this metal.

Thallium

Because of the anomalous behaviour reported for thallium by the previous workers (Kan, Sudovstov and Lazarew 1949), using resistance measurements, we have investigated it by our method up to higher pressures.

In two runs under mean pressures of 11 700 atm. and 13 400 atm. respectively, no signs of superconductivity could be observed above 2·35°K although an uncompressed specimen began to show superconductivity at 2·39°K. The whole transition curve was displaced by pressure